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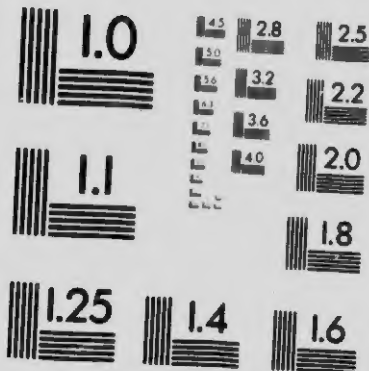


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INSECTS ECONOMICALLY IMPORTANT IN THE LOWER FRASER VALLEY



Being a paper read before the B. C. Entomological
Society, January 23rd, 1914, by R. C. Treherne,
Field Officer Dominion Division of Entomology,
Experimental Farm, Agassiz, B. C.

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Insects Economically Important in the Lower Fraser Valley

Being a paper read before the B. C. Entomological Society, Jan. 23rd, 1914, by
R. C. Treherne, Field Officer Dominion Division of Entomology,
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The object I have in presenting this paper is to record, as best I am able, as a result of the past two seasons' observations, the various insects occurring in the Lower Fraser Valley, which are of greater or lesser economic importance to the fruit growers and farmers. I shall endeavor to describe the various insects by their most distinctive larval and adult characteristics and their respective injuries to their host plants with brief notes on the life histories under Lower Fraser conditions, and remedies suggested for control.

THE FRUIT INSECTS.

The Eye-Spotted Bud Moth.

Tmetocera Ocellana Schiff.

This Tortricid probably ranks first among the various insects attacking the apple in the Fraser Valley. It is destructive only in the larval (worm) stage. The winter is passed in the partially grown larval stage attached to the main limbs and trunks of the trees, securely covered by a silken web. When the buds begin to burst in the spring, the young larvae cut through their silken coverings and commence to feed on the buds and developing leaves. The larva can be recognized by its color. It is chestnut brown, with head, legs and thoracic shield black, smooth and shiny. When full grown the larva is one-half an inch in length, although in the spring and

early summer the larva may vary from one-eighth of an inch to half an inch.

As all the eggs are not laid at one time, and as the hatching from the eggs does not occur conjointly with all the individuals, consequently the larvae enter their winter quarters in the fall in various stages of growth, and, in turn, appear in the spring with the same variations. The result of this is that larvae continue feeding to all dates until the last days of July before passing to the next stage of its history, the resting stage, or the pupa. The moth is supposed to be single-brooded, no evidence yet being received to indicate even a partial second brood. On the other hand, pupae may be formed by the more mature larvae by the first week of June. The pupa may be recognized, in its turn, by its length and color. It is chocolate brown in general color, with the abdominal segments somewhat lighter than the head, thorax and appendages; each segment of the abdomen possesses two rows of numerous toothlike processes, while the last segment possesses several hooked bristles used for the purpose of retaining it securely in its place of pupation. Length approximately half an inch. Pupae of this description may be found in the dried curled leaves so commonly seen on apple trees in the Lower Fraser during the summer. The pupal stage lasts from 13 to 20 days and carries over from the first week of June until well into August. The adult

moth, which is ashy gray and capable of expanding its wings about five-eighths of an inch, then appears from the resting pupa to lay eggs and again produce the destructive larvae. It is assumed, at the present time, that all of the eggs hatch and produce larvae before fall. The eggs are very minute, and are laid on both surfaces of the leaves.

The main injury is caused in the early spring, when the young larvae attack the developing buds, terminal and lateral, preventing the normal growth of shoots and forcing the growth of many side and lateral shoots in place of one, and by affecting the formation of blossom by the attack on fruit buds. The most efficient remedy is the application of arsenate of lead in the form of a spray at the time of the bursting of the buds and previous to the formation of bloom.

THE LESSER APPLE WORM.

Enarmonia Prunivera Walsh.

The life history of this Tortricid is very imperfectly known as yet, under our local conditions. It is universally spread over our present fruit areas of the Lower Fraser and Vancouver Island. It is commonly seen in the latter part of the summer, at the time of the fall fairs, on fruit in the orchards. For the reason that its nature of injury closely resembles that of the Codling Moth, it was thought advisable to prevent confusion by a brief reference to its characteristics.

The larva of the Codling Moth (*Carpocapsa pomonella* L.), another Tortricid, is when full grown about three-quarters of an inch in length, white or pinkish in color, with a brown head and faint tubercles over the body. A great proportion of the larvae of the first brood enter the apple through the calyx end, and some, when apples are touching, enter through the side. The well known excreta at point of entrance leaves a clue to the presence

of the larva in an apple. The larva after entering the apple penetrates to the core, and there remains until full grown, when as a rule it works its way by a different route to the side for the purposes of pupation.

The larva of the lesser apple worm enters the apples from either the calyx or stem end, and also on the side when apples are touching, in these respects resembling the larva of the Codling Moth. The larvae of the former, however, feed to a greater extent on the surface of the apple, devouring the flesh around the calyx and stem basins to the depth of half an inch. The larvae undoubtedly penetrate to the core, as do the Codling Moth larvae, but usually only in well ripened apples. The larva does not appear to form so definite a channel to the core as does the Codling Moth larva, appearing to feed more or less continuously on the flesh of the apple en route. The greatest difference between the two possibly is the color and shape. When full grown the larva is not more than half as long as the Codling Moth larva and is more pinkish in color. Furthermore, the terminal portion of the last segment is furnished with a small brown structure consisting of seven teeth.

It may readily be assumed that an arsenate of lead spray applied in the spring, and again in July, would offer the best remedies.

OLETHREUTES sp.

There is evidently a leaf roller of the above genus at work in Lower Fraser orchards which closely resembles the Bud Moth in habits. The adult moth is larger throughout, however, but of an ashy gray color. Its occurrence in the field is very local and thus far has not been observed in great numbers. Mr. Arthur Gibson, Chief Asst. Dom. Div. of Entomology, to whom the adult was referred, believed it to be of the above genus, and similar to the Eastern species *nimbatana*.

THE FALL WEBWORM.

Hyphantria Cunea Dru.

In 1903 the webs of this Arctiid were very conspicuous in British Columbia. In recent years this insect has not been so common, but the well known webs can be observed at times in the lower Fraser Valley. The full grown larvae are about an inch long, covered with long black and white hairs which project from numerous black tubercles. They feed on the foliage of fruit trees and woody shrubs and are confined within a thick silken web, thus being easily distinguishable. Arsenate of lead spraying when the leaves are quite small in the middle of summer, or the removal of the webs when they are more mature, will prevent marked injury to the trees.

THE TENT CATERPILLAR.

Malacosoma erosa Stretch.

This has not been prevalent during this past season. It is subject to years of prevalence and scarcity. It is apparent that parasites play an important part in the natural control of this insect. The following description of the larva is taken from Prof. H. F. Wilson's report of the Divn. of Entomology in the Biennial Crop Pest and Hort. Report, 1911-12. Corvallis Ex. Stat., Ore., relative to the species:

"*M. erosa*—Whitish, irregular oval spots on middle of back on all but the first few segments. On either side of these spots and somewhat separated from them is a broad blue band bordered on either side by a brick red line. Below that, on either side, and reaching to the legs, is a bluish space, characterized by one blackish dot on each segment marking the position of spiracles or "breathing holes." Below the caterpillars are dark blue with oval spots in median on all but first few segments. Over the whole of the caterpillars are numerous fine yellowish or cream colored hairs."

Insects of this species attack all orchard trees in the Lower Fraser with the exception of the pear, which apparently appears immune. The nature of the injury from these caterpillars are so well known that further reference is unnecessary. Suffice it to say that spraying with an enate of lead in the early summer and the mechanical destruction of the larvae, are recommended in years of prevalence.

THE APPLE FRUIT MINER.

Argyresthia conjugella Z.

In 1898 Dr. Fletcher, the late Dominion Botanist and Entomologist, referred to this insect as one of the worst enemies of the apple grower in British Columbia. Of recent years its presence has not been noted.

THE PLUM CURCULIO.

Conotrachelus Neruphar.

It has been considered advisable to mention the characteristics of this insect. The adult is a thick-set snout beetle about one-quarter inch long, and it lays its eggs in peculiar but characteristic crescent-shaped punctures on the skin of many orchard fruits, particularly the apple, peach and plum.

The female weevil first removes a portion of the skin of the fruit with her snout, and in the cavity thus formed deposits an egg. She then by instinct cuts portions of the skin of the fruit in either direction from the point of oviposition so that as the fruit swells and grows the pressure will not crush the eggs, the expansion being alleviated around the egg by the two latter formed incisions. Thus a characteristic crescent-shaped puncture is produced. These shaped punctures have been observed on some apple trees, for a long time neglected, growing at Agassiz this summer. Furthermore, verbal reports of the same have been received from Salmon Arm. No eggs,

larvae or adults have been taken, but as this insect is regarded as one of the worst affecting the fruit orchardist in other portions of Canada, it is well that a sharp lookout be kept in British Columbia.

THE CHERRY FRUIT FLY.

Rhagoletis cingulata Loew.

"This imported insect was recorded by Dr. Fletcher in 1906. He received it from Mr. W. R. Palmer, Victoria, B. C., where it was injuring some cherries. This was its first recorded appearance in Canada, and Mr. Palmer stated that he first noticed the holes in cherries in 1904." (Extract from report of Dr. C. Gordon Hewitt, 31st March, 1911, Exp. Farms, Canada.)

THE WOOLLY APPLE APHIS.

Schizoneura lanigera Hausm.

This aphid is probably the commonest known insect of its class to the fruit grower in the Fraser Valley. Its conspicuous white flocculent clusters in cracks and crevices of limbs and in pruning shears at once indicate its presence. Root forms also occur, forming swellings and scars on the finer roots of the trees; but as these forms are hidden from view, their importance is lost sight of. The secondary injury caused, allowing fungus diseases access to the tree, is as important as the attack on the tree by the aphid itself.

During the winter, on the stems will be found masses of the dead bodies of the summer's generations; but underneath, protected from the effects of temperature, may be found several small aphids of a brown color. If these survive the winter—as many probably do in the milder parts of this Province—they commence to migrate to the new wood of the past summer, when the buds begin to open. They begin to feed by inserting their beaks into the wood and produce a white, waxy

excretion as they grow. These all prove to be females, and each one is capable of producing young, which, in turn, produce more young, and so on until early in the fall, when winged forms are produced. These winged forms are black to the unaided eye, with distinct black nerved wings. At this point there appears to be a certain amount of doubt, at the present time, as to the next step in the life history. It is supposed that these winged forms migrate to the elm, and there produce several male and female aphids, which in turn produce eggs. The actual life history under Lower Fraser conditions has not, I believe, been studied; consequently we cannot do more at the present time than regard the researches of other investigators as approximate to our own.

The aphids on the stems can best be controlled by a weak solution spray of kerosene emulsion, or by summer strength lime sulphur with an addition of "black leaf 40." Where root forms are known to exist, these same sprays applied to the roots may be used, allowing the liquids to reach the aphids by partially removing the soil around the tree.

The Rosy Aphid—*Aphis sorbi* Kalt.

This aphid occurs in the Lower Fraser, but its presence and the injury caused would probably not be associated by the average grower. The fruit is not attacked, but by the indirect influence of the aphid attack on the fruit-bearing spurs and adjoining leaves, the fruit becomes gnarled, irregular and misshapen. These clusters of poorly-shaped fruits are commonly to be seen in any orchard of the Valley, but we have no definite idea as yet on its prevalence or degree of injury in comparison with the attacks of other aphids. It is altogether probable that we will find this species the most serious aphid pest of our apple trees unless due regard is paid to its control.

The life history of this insect is, like the woolly aphid, only imperfectly known. Colonies may be found on fruit spurs and in the curled leaves adjoining the blossoms in the spring. These colonies have sprung from an over wintering egg laid the previous fall, and are wingless. Several generations occur during the spring, and during early July winged forms appear and they migrate in numbers from the apple leaves to some unknown host plant. All efforts to trace the secondary host plant failed this past summer. According to Prof. H. F. Wilson of Corvallis, Ore., this spring migrant is "in general color black, abdomen brown with black markings and a black dorsal square shaped spot. The antennae about as long as the body and brown to black. Along each side of the abdomen is a series of dentate tubercles." Later in the year, about September, winged females return again to the apple, giving birth to several forms, which in turn produce eggs. The gnarled appearance of the fruit in the clusters, and the absence of any assignable cause by the migration of the summer forms, is liable to confuse the grower who may expect an explanation of the conditions of his fruit.

The remedy suggested has proven itself very efficient; and referring again to Prof. Wilson's work in Oregon, for want of any local experience of our own, we quote: "Lime sulphur should be used, winter strength, and 'black leaf 40' added at the rate of one part to 900 parts of the diluted lime sulphur." It is very essential for success that this spray be applied just as the buds are opening into leaf. When the leaves commence to curl, spraying cannot be accomplished with proper results.

The European Grain Aphid—*Siphocoryne avenae* Fab.

This aphid occurs commonly on the apple in the Lower Fraser, being often found associated in the colonies of

aphid sorbi in the spring on the leaves. Apparently the life history resembles that of aphid sorbi in the general details, with the exception that more is known of its hosts. It uses the apple as the host in the spring and fall, migrating to small grains and grasses during the summer. At Agassiz, during the past summer, these aphids under observation migrated to young wheat plants in the latter part of June. The remedies recommended are similar to those for the rosy aphid.

The Apple Aphid—*Aphis pomi* L.

This common tree aphid is present in all orchards, and is universally recognized by its habit of clustering in great numbers on the new shoots and under the fresh green leaves of the apple. The shiny black eggs are also common sights to the orchardist during the fall and spring on his apple trees. The same remedies as before suggested are again of value in controlling this pest, an early application being again necessary. It might be mentioned that the eggs are not amenable to practical treatment.

The Cherry Aphid—*Myzus cerasi* L.

This black aphid may be found throughout the summer in the curled leaves of the cherry tree. The lime sulphur and "black leaf 40" spray is again of benefit in the early spring.

The Oyster Shell Scale—*Lepidosaphes ulmi* L.

The coecid is very common on all classes of trees in the Fraser Valley. The moist, humid climate of the immediate coastal region is particularly well suited to its life and reproduction. The scale can be recognized from its well known shape, such as its name implies, and is known to all orchardists. In a general way the scale is not dangerous, as the methods of orchard culture tend to retain its numbers within reasonable bounds. Branches of trees, however, and, in rare cases,

whole trees in neglected orchards or wood lots, may be killed by the effects of this scale alone. At certain points in the Fraser Valley wild crab apple trees may be seen standing dead by the roadside. Undoubtedly the oyster shell scale and the tent caterpillar have combined forces to cause their death; but while we do not mourn the loss of these wild crab trees, yet they stand as examples of what might happen in the orchard if proper precautionary measures are not taken.

The female scale is about one-eighth of an inch in length, usually dark brown in color. In the spring a few may be grey, but this is apparently the result of winter or old age. The male scale resembles that of the female in shape and color, but is considerably smaller. Eggs are laid in the fall under the scale of the female, and if one of these scales be removed during winter numerous small white eggs (from 40 to 100) will be noticed.

In the spring these eggs hatch, producing some very minute yellowish insects which are comparatively active soon after hatching. In time each individual will settle down, insert its beak into the plant and commence to suck the sap. At this time the insect is free of any covering or "scale." However, as it grows and moults, a waxy excretion covers the body, forming gradually the characteristic "oyster shell scale." The female remains at the one point throughout her life, and becomes full grown in from two to three months. The male scales continue their stationary feeding until full grown, when they develop two very minute and delicate wings, fertilize the female and die. The female insect then, in turn, produces eggs under her scale and dies, and the eggs pass the winter as such, awaiting spring before they hatch. Thus the scale is single-brooded and only capable of producing during the season.

As regards remedies, it has been found that the lime sulphur spray has little effect on the eggs during winter,

except perhaps to loosen and wash from the trees a number of old scales and eggs, but it is very efficient against the young insects hatching in the spring. Watch should be kept to determine when this hatching takes place, but as a rule it occurs after blossoming. In the Lower Fraser Valley apples begin to bloom the last days of April, and they bloom for a month; consequently one might spray summer strength lime sulphur the second week of May or thereabouts. As a general rule it will not be necessary to spray every year for this insect, but as often as the discretion of the grower would warrant. (It should be remembered that this statement applies only to this insect.) In cases where trees have become very badly encrusted with scales, mosses and lichens, it would be well to apply a dormant winter spray of either a three per cent, caustic soda solution or one pound of Gillett's lye in four gallons of water. This procedure is better not followed more than once in four or five years, as it has a tendency to hidebound the trees.

The scale is heavily parasitized in the Fraser Valley.

The Red Humped Apple Caterpillar—*Schizura concinna* S. & A.

The name of this caterpillar is obtained from a prominent red hump on the fourth segment of its body. Specimens of the larvae of this species may at times be met with devouring the leaves of apple trees. A simple spraying of arsenate of lead will effectively control them.

The Cigar Case Bearer—*Coleophora fletcherella* Fernald.

At every orchard in the Lower Fraser visited during the past two years, this insect has been found to occur. It cannot, however, be classed as one of the important insects of the orchard. The grower may recognize the species when a small cigar-like case is seen standing erect on the surface of a leaf.

This case contains a small caterpillar which feeds on the surface of the leaf. The winter is passed as the larva in its case attached to stems and twigs. Migration to the leaves occurs in the spring, and the adult moths appear in July, giving rise to the next season's generation. Arsenate of lead, applied either before or after blossoming, will control this species.

The Pear Slug—*Eriocampoides limacina* Retz.

A smooth, slimy-looking slug may often be met with on the leaves of cherry, pear and plum. This is the larva of a sawfly. The adult is about one-fifth of an inch long, black, somewhat shiny, with four wings, rather dusky in appearance, which are folded over the abdomen when at rest on a leaf. Adults have been observed flying in the Fraser Valley during May and early June, depositing eggs. Small blister-like areas may be seen on the upper leaf surface, indicating that an egg has been deposited there by the female. Minute larvae (slugs) have been observed on the leaves during the second week of June. The first brood of larvae evidently commence about this time. From the middle till the end of July the period of pupation is in progress, as but few slugs can be found on the trees. During the last days of July and early August adults may again be seen flying and depositing eggs, so that during August and September larvae are quite common again. Thus the insect in the Lower Fraser is double brooded. The first larval brood of June may cause injury to the tree, but by arsenate of lead or pyrethrum powder they can be combated. The second brood of larvae in August can almost be classed as a benefit to the tree, for the attack of defoliation checks the growth and assists the tree to ripen its wood for winter.

Click Beetles—*Elateridae*.

During the month of May in Fraser Valley, when the apples are in bloom,

large numbers of elater or click beetles may be seen clustered around the blossoms and developing buds. Several species appear to be involved at one time. By an experiment performed to find out what damage was caused, it was shown that these large black beetles were cutting off the pistils and stamens of the blossoms, devouring the calyx cup and the petals, as well as the developing leaves of the tree. There is no question at all that a large number of prospective fruits are destroyed by the destruction of the blossoms and the calyces. Furthermore, the depredations of these beetles are continued during the summer upon leaves and young fruit. Portions of the epidermis and pith of the apple will be devoured. These areas heal over, but fruit attacked in this way later in the year shows brown and depressed areas on its skins, greatly injuring the marketable appearance of the fruit. This form of injury is, we believe, practically unrecorded; therefore we are unable to advise any definite course of remedy. Arsenate of lead applied in the spring might have the right effect, so long as the blossoming period and the setting of fruit were not interfered with.

The Pear Leaf Blister Mite—*Eriophyes pyri* Pagnst.

This arachnid is to be found in every orchard visited in the Lower Fraser Valley. Its work can be recognized by the rusty, rough, blister-like appearance of the under surfaces of the leaves. The mites are microscopic in size and can only just be seen with a lens. The mites pass the winter in the egg stage in the buds, hatch in spring and migrate to the leaves when the buds are expanded. Here they burrow between the two surfaces of the leaf and feed and set up an irritation which produces at first the rusty brown color on the surface which later becomes black. Apples and pears are attacked. To control these animals, great care is required. Lime sulphur or bordeaux

mixture, or any of the oil emulsions, applied in the fall or spring under pressure will be found quite efficacious as remedies.

The Apple Leaf Hopper—*Empoasca mali* Leb.

Causes the peculiar white specking of apple leaves. Caustic or soap sprays applied in the spring, with special attention being paid to the under surface of the leaves, will retain these insects within reasonable bounds.

From the above it will be seen that the two essential mixtures are lime sulphur and arsenate of lead. Black leaf 40 is also of use against aphids. These three ingredients can be mixed together satisfactorily without injury to the relative effectiveness of any one. It will be seen also that the first spraying on apple trees is required during April, or at the time when the buds are breaking, and previous to the formation of blossom. The second spraying should take place in June, or after the blossoms have fallen. The third, or mid-summer sprays will only be required during exceptional cases and relative to special insects. The same applies to the fall sprays and winter

spraying. The first two sprayings are necessary, one year with another, in every orchard in the Lower Fraser. The later sprayings are optional to the grower, and need only be applied in special cases of severe infestation, and as specially directed remedies against special outbreaks. It should be borne strictly in mind, however, that these spray recommendations can be considered only from the standpoint of the insects. The various fungus diseases are probably more serious to the apple grower than any existing insect attack, and these diseases have to be fought by special methods and at special times. From information at our disposal, we are informed that three sprayings a year are necessary in the majority of orchards in the Valley. The first two coincide with the first two insect sprays, viz., in April and in June, and the third takes place in the fall, in September or October, depending on climatic conditions of the year, and as to whether the tree is in fruit or otherwise. The lime sulphur may be used in the spring sprayings against the fungi as against the insects. Bordeaux or lime sulphur may be applied in the fall, according to the preference of the grower.

Essential Times for Spray Applications to Apples.

Insect.	Time.	Spray.
Bud Moth	April	Arsenate of Lead
Lesser Apple Worm	April and July	" "
Leaf Roller	April	" "
Fall Webworm	July	" "
Tent Caterpillar	June	" "
Woolly Aphis	April and June	Kerosene Emulsion
Cigar Case Bearer	April or June	Arsenate of Lead
Pear Slug	June	" "
Click Beetles	April	" "
Rosy Aphis	April	Lime Sulphur and Black Leaf 40
European Grain Aphis	April	" "
Apple Aphis	April	" "
Oyster Shell Scale	June	Lime Sulphur
Pear Leaf Blister Mite	April or September	" "

Small Fruit Insects

The Strawberry Root Weevil (*Otiorhynchus ovatus*).

The larva of this weevil is a small white grub which when full grown is about three eighths of an inch in length. It is commonly found in the soil of a strawberry plantation, among the roots of the plant, which it devours readily and causes in so doing rapid deterioration of the field. The adult is a small dark brown beetle about $\frac{3}{4}$ of an inch long. It feeds during the night on the leaves, forming irregular feeding areas on the edge of the leaf. In the adult stage it has not proven destructive and the appearance in houses during the summer and fall is not indicative of any harm. In the larval stage it is of great economic importance, and as such is the worst enemy of this class of fruit. The eggs are laid during June, July and August in the soil to the depth of an inch. The larvae feed lightly on the roots until fall and pass through the winter without causing untoward injury to the roots. In the spring the larvae continue feeding ravenously until the pupal stage is reached in May and June. From these pupae which are formed in the soil, from one to two inches deep, the adults emerge to continue the generation. In the Fraser valley the weevil is single brooded and in habit inclined to be gregarious, which means that provided sufficient food and shelter is at hand they do not move very much and remain congregated in infestation areas. From these considerations it has been found that plantations suffer more each succeeding year of growth, it frequently happening that the third season of growth is rendered unremunerative in yield of fruit. All efforts to control this weevil by artificial methods of spraying have proven more or less unsatisfactory. However, by judicious management of crops, by rotation, thorough cultivation, by the use of chickens, and the growth of suitable

varieties, the depredations of the weevil will be much alleviated.

The Black Vine Weevil

(*Otiorhynchus Sulcatus*)

This species is similar in habits to *O. ovatus*. It is larger throughout all its stages. It is found in strawberry plantations to a minor degree as compared to the smaller species. This species may be mentioned as being more troublesome to garden and greenhouse plants than to strawberries.

Spittle Insects

(*Cercopidae*)

Are frequently met with in strawberry fields and in grass and garden plots and may be recognized by the objectionable saliva like substance that surrounds them. The amount of their injury, beyond rotting the fruit it may be in connection with, is not very extensive, and no control measures have proven essential. Should such be required, however, kerosene emulsion applied with pressure will be of use.

The Currant Borer

(*Aegeria Tipuliformis* Clerck)

The adult insect is a moth. It is probably not known to the average grower in the Fraser Valley as the cause of injury to his currant bushes. Local observations on this insect indicate that the moths are flying the second week in June. On any bright sunny day at that time of year, by carefully watching the currant bushes and surrounding vegetation the moths may be seen darting rapidly about in the air resting at times on the leaves of plants. On dull days they are not so active, for it would seem that the bright warm days of summer are more in accord with their nature. If one of these moths be captured, it will prove to be one of the most beautiful of the many insects of the orchard. It is a clear winged Sesiid, about half an inch in length, with a body of a steel blue lustre with several bright golden bands

around the neck and across the abdomen, while on the last segment is a prominent tuft of long scales.

At the latter part of June the female has deposited her eggs. In one case, under observation, 80 eggs were laid by a single moth. The eggs were very small and yellowish in color, and were tucked away under corrugations of the bark of the bushes in axils of buds and under the edges of lichens which grow so frequently on the stems of shrubs and trees in the Valley. On the 1st of July the larvae had hatched from the eggs and had penetrated to the pith of the stems, small amounts of cast-off material indicating the point of entrance. The larvae feed on the central pith of the currant bushes, and they become half-grown at the approach of winter. The following spring, feeding and growth is continued uninterruptedly until May. The full-grown larva is about half an inch long, yellow with a brown head. The pupa is then formed in the pith, and it remains dormant about 15 days until the adult moth is ready to emerge. When ready, the pupa forces its way through a hole to the outside of the stem until it protrudes nearly its whole length from the stem. The anterior portion then breaks open, and the adult moth appears ready to commence the generations again. Affected bushes will show a slight yellowing of the leaves and a general dwarfed appearance of the plant. The insect is very common in the Lower Fraser Valley on currants, and no evidence has yet been given where bushes die from the effects of this moth alone, although in severe infestations such may prove to be the case. The remedy is comparatively simple. Prune out all the old wood in the early spring, or in late fall, and burn the cuttings. The standard form of bush should also be avoided.

The Currant Fruit Fly

(*Epochra canadensis* Loew).

Dr. Fletcher in 1901 reported this

insect injuriously prevalent on Vancouver Island and in the Lower Fraser Valley. It is probable that it is still present in the immediate coast regions, but not in sufficient numbers to attract the attention from fruit-growers. The dryer portions of the Province appear to suit this insect, for from there it is reported recently as of economic importance. In short, the adult is a small fly with a fine tapering abdomen. In the early summer the female fly will deposit her eggs just beneath the skin of the fruit and the maggots will devour the pith and seeds. When ready to pass to the pupa the maggot burrows out of the berry, and will drop to the ground, where it pupates just below the surface. Chickens and cultivation will assist in controlling this insect.

TRUCK CROP INSECTS.

The Potato Flea Beetle

(*Epitrix cucumeris*, Harris).

This insect is common to the Fraser Valley, and may be seen as minute black specks on the surface of potato leaves during the summer. The adults devour portions of the epidermis of the leaf, and, when disturbed, hop freely to great distances. The larvae and pupae are found in and around the roots of the plants in the soil. Reports of injury from this insect must have been received from the Coast since 1901. (Dr. J. Fletcher, Annual Report Experimental Farms, 1901.)

The adults are very minute, being only about one-sixteenth of an inch long, jet black, with yellow antennae and legs. They are mainly destructive in the early spring, but can be controlled by the use of arsenate of lead. The arsenate can well be mixed with the Bordeaux mixture, which is used to offset the ill effects of blight and fungus diseases of the plants. Nicotine sprays are believed to be equally efficacious.

The Red Turnip Beetle

(*Entomoscelis adonidis*. Fab).

This beetle has been reported at Hazelton and points north of Lillooet, B. C., and from as far north as Dawson, Y. T., as destructive to cabbages and turnips. During the past summer a report, without specimens, was received from Fort George, probably referable to this insect. It would appear that arsenate of lead would again prove applicable for control.

The Cabbage Maggot

(*Pegomya brassicae*. Bouche).

This insect is by far the most serious and important one attacking cabbages, radishes, turnips, cauliflowers, celery, rape, and the various wild cruciferous plants in the Lower Fraser Valley. It yearly exacts a toll from gardeners and farmers far exceeding any other insect of its class. More requests for satisfactory control measures are yearly answered about this insect than any other in the Valley. It must be admitted, however, that we yet await a satisfactory and practical remedy, applicable in particular to field conditions.

The adult is a small fly, smaller, but resembling the common house fly. It appears in April in the Fraser Valley ready to lay eggs on young cabbage and other plants. The eggs are laid against the plant root on the surface, thus readily distinguishable to the unaided eye. Small footless white maggots emerge from the eggs and penetrate the root. Here they continue to feed and grow to approximately one third inch long before passing to the pupa in the soil. From the pupa the fly eventual emerges, giving rise to further individuals. The entire individual life history carries over approximately two months, and two and probably a partial third brood occurs during the summer. The life history under strictly local conditions has not yet been properly studied, consequently we are unable as yet to state what occurs at the latter part of the season.

The control of this maggot has been experimented with at Agassiz during the past summer, and while it is not proposed to give the results at this juncture a few significant points may be stated and judged accordingly as passing results.

It is proposed to continue the investigations during the next and future seasons. The main mixture experimented with was the Carbolic Emulsion. This mixture is made by dissolving two pounds of soft soap in two gallons of warm water, to which is added two pints of crude carbolic acid. This stock solution is then diluted 1-20 and applied at the ratio of 5 oz. to each cabbage.

It was figured that ten cents worth of the diluted mixture would treat 100 plants once at this rate, not including the cost of labor. It was necessary to treat each cabbage seven times between the end of May and the middle of July, consequently the cost per plant was approximately 70 cents, exclusive of labor. The past summer's work indicated that the above mixture applied 7 times only held a balance in favor of treatment of 33 per cent., covering a great many varieties of cabbage. There is undoubtedly such variation in the degree of resistency between the various varieties of cabbage, consequently it is not fair to judge the 33 per cent. with too great a degree of detail. It is merely wished to point out that the Carbolic Emulsion, which is the most recommended mixture for control, has not offered perfect results from treatment. A greater loss than maturity was noticed under the above treatments in the individual comparative weights of the cabbage harvested. Without going into detail again with the various varieties, it was found that covering the whole experiment a net increase of approximately two pounds per individual cabbage was figured in favor of the treated cabbages over those left untreated. Quicker maturity of the treated plants also resulted. The

diluted mixtures did not harm any cabbage, not even those in the seed bed when treated while growing. Dipped plants at transplanting were apparently checked somewhat, but in the main survived. The eggs were not affected by treatment by either carbolic or kerosene emulsions. In a large turnip field experiment performed at Agassiz two significant points appear to have been demonstrated. (1) The net results, in weights of turnips harvested on equal proportions of an acre from roots treated with solutions of kerosene and carbolic emulsions over untreated roots, do not warrant the time labor or expense of liquid treatment of the roots. (2) That thinly seeded rows possess more eggs and maggots per root than thickly seeded rows, and that the process of "thinning" the roots in the row again reduces the infestation per individual. Consequently from the past summer's experience it would seem advisable to seed heavily, roughly 60-80 plants to the lineal foot, and follow this by "thinning" in the month of June. Experiments performed by others in the past have indicated that good success may follow the use of thin felt paper tarred discs placed round the necks of cauliflowers and cabbages flush to the ground; that radishes may be screened against the fly, that the old cabbage stalks and refuse left around the field had best be destroyed as soon as the crop is harvested, and that rotation of land be practised as far as possible.

The Imported Cabbage Worm

(*Pontia Rape. Sch.*)

According to the late Dr. Fletcher in his annual report of 1901-1902, this

insect was first recorded at Kaslo in 1899. It proved very troublesome in 1901, having spread over the entire province. During the summer of 1902 it reached Vancouver Island. This insect of recent years, though present, has not attracted much attention from gardeners and farmers. The white butterflies are noticed early in the spring and are known to all. The caterpillars feed on a number of plants of the cruciferous family; they are green in color and over one inch in length when fully mature. Arsenate of Lead applied before the cabbages "head out" will be found the best remedy.

The Cut-Worms

(*Peridrom. saucia Hbn.*)

(*Eupsephopoeetes procinctus Grt.*)

Are both recorded for the Lower Fraser Valley. These troublesome insects are known to all and at times in years of prevalence become very destructive. They can be controlled when their damage is observed by the use of a mixture of bran, molasses and Paris Green. The "worms" as a rule only feed at night, so if this mixture is placed near the plants in the evening, many cut worms will suffer from the effects of the arsenic.

The Onion Maggot.

(*Phorbia cepetorum. Meade*)

Is a species very similar to the cabbage maggot in characteristics and habits and can be controlled the same way, with the addition that affected plants can be pulled up whenever seen during the season.

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